Fig. 1

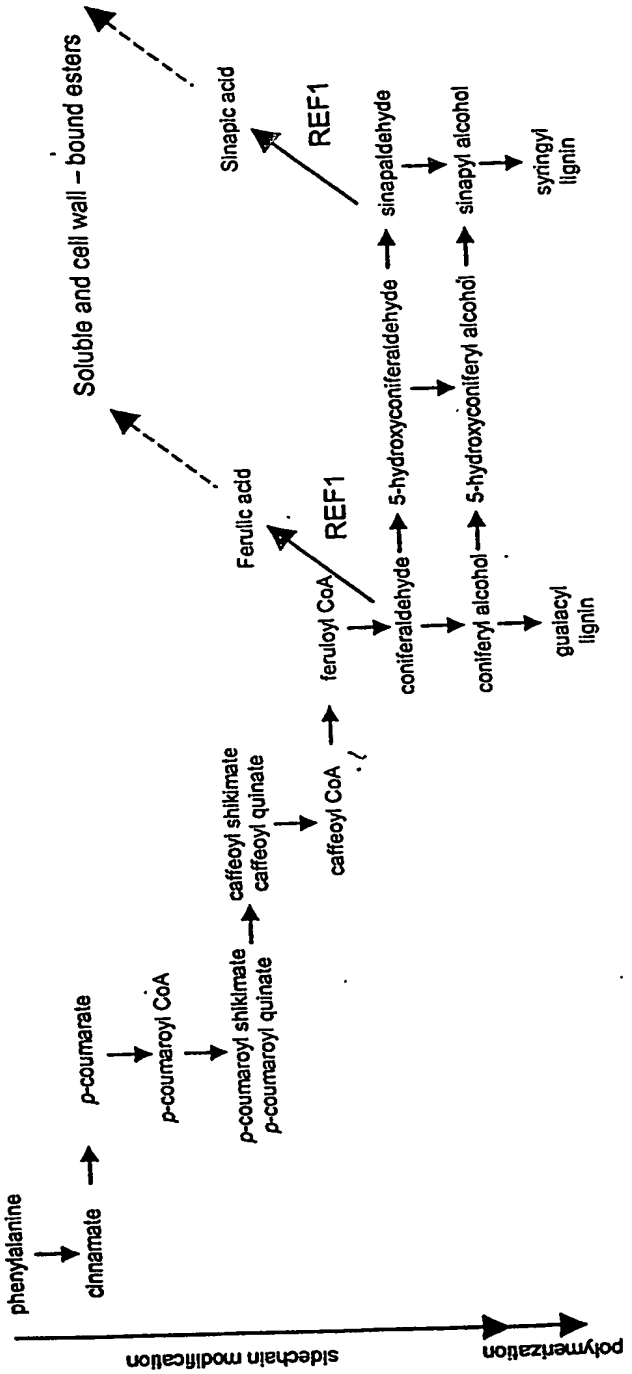
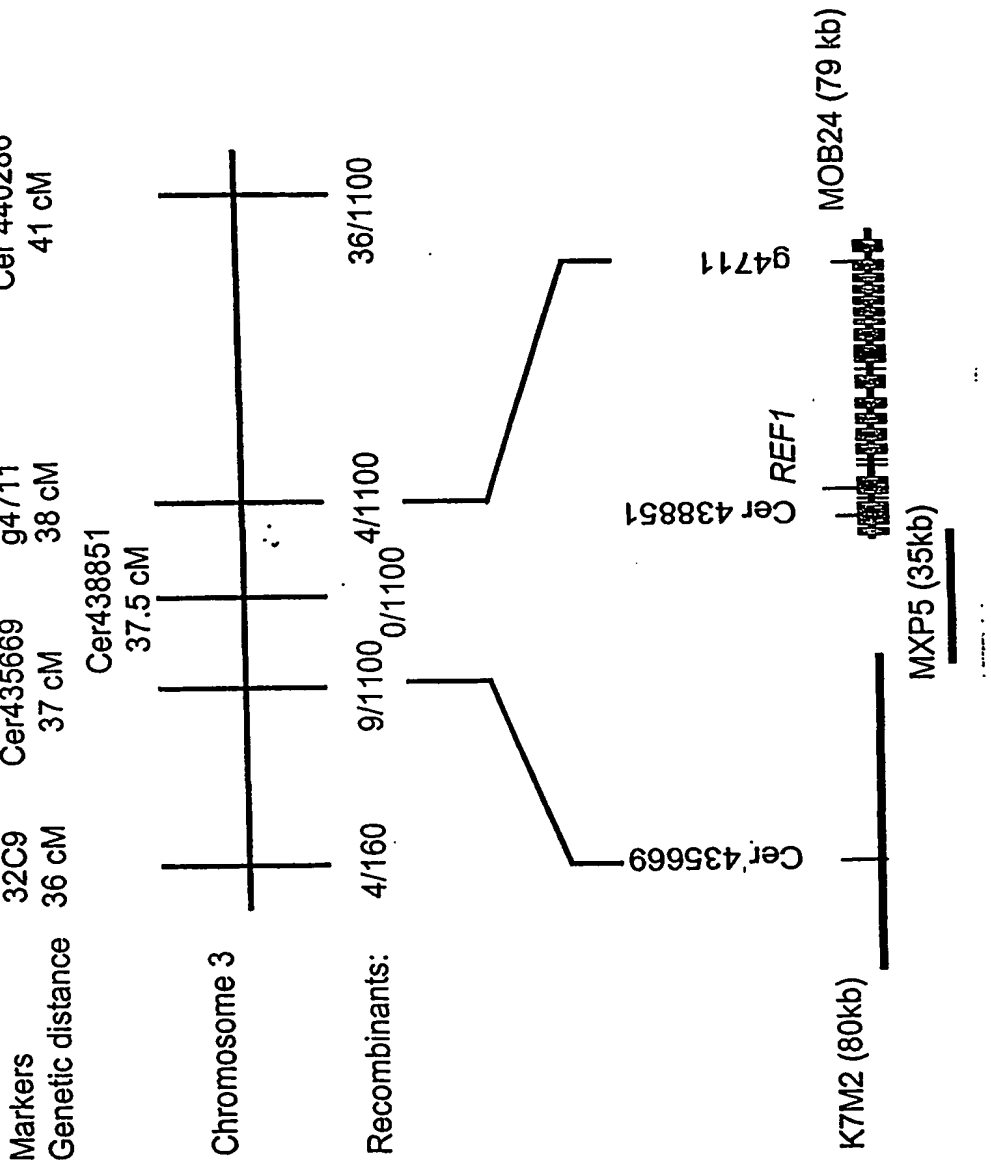

ring modification
phenylalanine
cinnamate
p-coumarate
p-coumaroyl CoA
p-coumaroyl shikimate
p-coumaroyl quinate
caffeoyl shikimate
caffeoyl quinate
caffeoyl CoA
feruloyl CoA
coniferaldehyde
coniferyl alcohol
gualacyl lignin
Ferulic acid
REF1
5-hydroxyconiferaldehyde
5-hydroxyconiferyl alcohol
Soluble and cell wall – bound esters
Sinapic acid
REF1
sinapaldehyde
sinapyl alcohol
syringyl lignin
sidechain modification
polymerization

Fig. 2


Markers
Genetic distance
32C9
36 cM
Cer435669
37 cM
Cer438851
37.5 cM
g4711
38 cM
Cer 440286
41 cM
Chromosome 3
Recombinants:
4/160
9/1100
0/1100
4/1100
36/1100
Cer 435669
g4711
Cer 438851
REF1
MOB24 (79 kb)
MXP5 (35kb)
K7M2 (80kb)

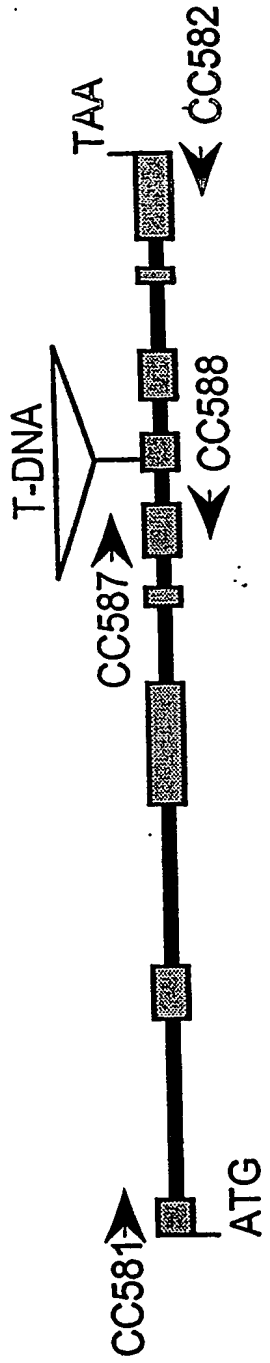


Fig. 3

Fig. 4

At REF1 nucleic acid and amino acid sequences

Panel A

Arabidopsis REF1 EST sequence (SEQ ID NO:1)

Skibbe et al., AtALDH1a
Vasilou classification # ALDH2C4

(EST clone Gene bank ID # T43357) 1625 bp

CCACGCGTCCGAGAGAGAGAGAGAGAATTACAAAGAAAAATAAATGGAGAACGGCAAATGCAACGGAGC
CACGACGGTGAAGTTACCGGAGATCAAATTCACCAAGCTTTTCATCAACGGCCAGTTCATTGATGCTGCT
TCAGGGAAGACGTTTGAGACGATAGACCCTAGGAACGGTGAAGTGATCGCAACAATAGCCGAAGGAGAC
AAAGAAGACGTTGACTTGGCCGTTAACGCTGCACGTTACGCCTTCGACCATGGTCCTTGGCCTCGCATGA
CCGGCTTCGAGAGGGCAAAGCTTATAAACAAATTCGCAGACTTAATAGAGGAAAACATTGAAGAATTGGC
TAAACTTGATGCGGTTGACGGTGGAAAATTGTTCCAATTGGGGAAATATGCTGATATTCCGGCCACAGCC
GGTCATTTTCGATACAATGCGGGTGCAGCGGATAAAATCCACGGCGAGACTCTTAAAATGACGCGTCAAT
CGTTGTTTGGATACACCCTCAAAGAACCAATTGGAGTGGTTGGTAATATCATCCCTTGGAATTTCCCAAG
CATTATGTTTGCCACAAAGGTAGCTCCGGCTATGGCTGCTGGTTGCACCATGGTGGTCAAGCCAGCTGAa
CAGACTTCACTCTCTGCTTTGTTCTATGCCCATCTCTCAAAAGAAGCGGGAATTCCTGATGGTGTGCTCAA
CATTGTAACTGGTTTTGGATCAACTGCTGGAGCTGCCATTGCCTCCCATATGGACGTAGACAAAGTTAGT
TTCACTGGGTCAACAGATGTTGGAAGGAAGATAATGCAAGCCGCAGCCGCAAGTAATCTCAAAAAAGTTT
CCCTTGAATTAGGCGGGAAATCGCCACTTCTCATATTCAACGACGCTGATATTGACAAAGCCGCCGATCT
TGCGCTTCTCGGTTGCTTTTACAACAAGGGTGAAATTTGCGTGGCGAGCTCTCGTGTGTTTGTTCAAGAA
GGTATATACGATAAGGTTGTGGAGAAGTTAGTAGAGAAGGCTAAAGATTGGACCGTTGGTGATCCTTTT
GATTCCACTGCTCGACAAGGACCTCAAGTGGATAAAAGACAGTTTGAGAAGATTCTATCTTACATTGAGC
ACGGTAAAAACGAAGGAGCGACCTTATTAACTGGAGGAAAAGCCATTGGAGACAAAGGATATTTCATCCA
ACCAACTATATTCGCAGATGTCACTGAGGATATGAAGATATACCAAGATGAAATCTTTGGACCAGTCATG
TCACTGATGAAATTCAAGACGGTAGAGGAAGGGATCAAATGCGCAAACAACACGAAATACGGTCTTGCAG
CAGGAATACTAAGCCAAGACATAGACTTGATCAACACGGTTTCGAGGTCAATCAAAGCTGGAATCATTTG
GGTTAATTGCTACTTCGGGTTTGATCTTGACTGTCCTTATGGTGGCTACAAGATGAGTGGTAATTGTCGT
GAAAGTGGCATGGACGCTCTCGACAACTATCTACAAACCAAATCCGTCGTTATGCCTCTTCACAATTCCCC
TTGGATGTAATAAAATTGTCCATAACACATAGAAAAAAACTTAATCCAATGATAATAAGGCGGCTTGAATT
AAAAAAAAAAAAAAA

Fig. 4, continued

Panel B

Arabidopsis REF1 open reading frame sequence (1506 bp) (SEQ ID NO:2)

atggagaacggcaaatgcaacggagccacgacggtgaagttaccggagatcaaattcaccaagcttttcatcaacggccagttcattgat
gctgcttcagggaagacgtttgagacgatagaccctaggaacggtgaagtgatcgcaacaatagccgaaggagacaaagaagacgtt
gacttggccgttaacgctgcacgttacgccttcgaccatggtccttggcctcgcatgaccggcttcgagagggcaaagcttataaacaaatt
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Panel C

Arabidopsis REF1 protein sequence (501 amino acids)

Skibbe et al., AtALDH1a
Vasilou classification # ALDH2C4

MENGKCNGATTVKLPEIKFTKLFINGQFIDAASGKTFETIDPRNGEVIATIAEGDKEDVDLAVNAARYAFDHG
PWPRMTGFERAKLINKFADLIEENIEELAKLDAVDGGKLFQLGKYADIPATAGHFRYNAGAADKIHGETLKMT
RQSLFGYTLKEPIGVVGNIIPWNFPSIMFATKVAPAMAAGCTMVVKPAEQTSLSALFYAHLSKEAGIPDGVLNI
VTGFGSTAGAAIASHMDVDKVSFTGSTDVGRKIMQAAAASNLKKVSLELGGKSPLLIFNDADIDKAADLALLG
CFYNKGEICVASSRVFVQEGIYDKVVEKLVEKAKDWTVGDPFDSTARQGPQVDKRQFEKILSYIEHGKNEGA
TLLTGGKAIGDKGYFIQPTIFADVTEDMKIYQDEIFGPVMSLMKFKTVEEGIKCANNTKYGLAAGILSQDIDLI
NTVSRSIKAGIIWVNCYFGFDLDCPYGGYKMSGNCRESGMDALDNYLQTKSVVMPLHNSPWM

Fig. 5

REF1 Homologs from Other Plants

Arabidopsis REF1 Homolog At1g23800

Skibbe et al., ATALDH2b
Vasilou classification # ALDH2B7

(Gene bank ID AY113912) 1636 bp

atggcatcaa gaagagtttc ttcgctgctc tctcgctctt tcatgtcctc ctcacgttct
atcttctctc ttagaggcat gaacagagga gctcaaagat acagtaacct cgctgctgct
gtcgaaaaca ctattactcc accagtgaaa gttgaacaca cacagcttct aatcggtgga
agattcgttg atgcagtgtc aggaaaaact ttccctactt tggatccaag aaatggagaa
gtgattgctc aagtgtctga aggtgatgca gaagacgtga accgcgcggt tgcagctgca
cgaaaggctt ttgatgaagg accatggcct aaaatgacag cttatgagag atcaaagata
ctgtttcgtt tcgctgattt aatcgagaaa cataatgatg agattgctgc tcttgagact
tgggataatg ggaaacctta tgaacaatct gctcaaattg aagtaccaat gcttgctagg
gtgttccggt actatgctgg ttgggcagac aagatacatg gaatgacaat gccaggagat
ggtccacacc atgtgcagac cttacatgag cctataggag tcgctggaca aatcatccca
tggaacttcc ctcttctcat gctttcttgg aaacttggac cagctttagc ttgcggtaac
accgttgttc tcaaaactgc tgagcaaact cctctatctg ctcttcttgt tgggaaacta
cttcatgagg ctggacttcc tgatggagtt gtgaatatag tttctggatt tggggctact
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gatgttggga agattattct tgagttagct tcaaaaagca accttaaggc agtgactctt
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gtcaaggctg ttgttacttc cctcaagaac cctgcctggc tctaaaccat accaggtggt
tacacttatt tctcga

ALDH2b (ALDH2B7)

Skibbe et al., ATALDH2b
Vasilou classification # ALDH2B7

(Gene Protein ID # AAG42016)

Fig. 5, continued

MASRRVSSLLSRSFMSSSRSIFSLRGMNRGAQRYSNLAAAVENTITPPVKVEHTQLLIGGRFVDAVS
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IAALETWDNGKPYEQSAQIEVPMLARVFRYYAGWADKIHGMTMPGDGPHHVQTLHEPIGVAGQIIP
WNFPLLMLSWKLGPALACGNTVVLKTAEQTPLSALLVGKLLHEAGLPDGVVNIVSGFGATAGAAIAS
HMDVDKVAFTGSTDVGKIILELASKSNLKAVTLELGGKSPFIVCEDADVDQAVELAHFALFFNQGQC
CCAGSRTFVHERVYDEFVEKAKARALKRNVGDPFKSGIEQGPQVDSEQFNKILKYIKHGVEAGATLQ
AGGDRLGSKGYYIQPTVFSDVKDDMLIATDEIFGPVQTILKFKDLDEVIARANNSRYGLAAGVFTQNL
DTAHRLMRALRVGTVWINCFDVLDASIPFGGYKMSGIGREKGIYSLNNYLQVKAVVTSLKNPAWL

Fig. 5, continued

Arabidopsis REF1 Homolog Tair At3g48000

Skibbe et al., AtALDH2a
Vasilou classification # ALDH2B4

(Gene bank ID AF327426) 1854 bp

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cggctcgtag agtgtcttct cttttatctc gatcttttc agcttcctct cccttactgt ttcgttctca agggagaaat
tgttacaatg gagggatctt aaggagattt ggaacctctt ctgctgctgc tgaggaaatc ataaacccat ctgttcaagt
ttctcacaca cagctcctca tcaatgggaa ctttgttgac tctgcttctg gtaagacgtt
tccgactctt gatccgagga caggcgaagt cattgctcat gtagctgaag gcgatgctga
agatatcaat cgagctgtga aagctgcaag gacggccttt gatgaaggac cttggcctaa
aatgagtgct tatgaaaggt caagagtttt gttgaggttt gcagatttgg ttgagaaaca
cagcgaagag ctcgcgtctc tagagacatg ggacaatggc aagccttacc aacaatcctt
gaccgcagag attcccatgt ttgcaagatt gttccgttac tatgctggat gggcggataa
gattcatgga ctaacaattc cagctgatgg aaactatcaa gttcacacat tacatgaacc
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ttgtgatact tctaataaat ttttcattgt tgtttattca aaaaaaaaaa aaaa

ALDH2a (ALDH2B4)

Skibbe et al., AtALDH2a
Vasilou classification # ALDH2B4

(Gene bank Protein ID AF327426) 538 amino acids

MAARRVSSLLSRSFSASSPLLFRSQGRNCYNGGILRRFGTSSAAAEEIINPSVQVSHTQLLINGNFVD
SASGKTFPTLDPRTGEVIAHVAEGDAEDINRAVKAARTAFDEGPWPKMSAYERSRVLLRFADLVEKH
SEELASLETWDNGKPYQQSLTAEIPMFARLFRYYAGWADKIHGLTIPADGNYQVHTLHEPIGVAGQI
IPWNFPLLMFAWKVGPALACGNTIVLKTAEQTPLTAFYAGKLFLEAGLPPGVLNIVSGFGATAGAALA

Fig. 5, continued

SHMDVDKLAFTGSTDTGKVILGLAANSNLKPVTLELGGKSPFIVFEDADIDKAVELAHFALFFNQGQC
CCAGSRTFVHEKVYDEFVEKSKARALKRVVGDPFRKGIEQGPQIDLKQFEKVMKYIKSGIESNATLEC
GGDQIGDKGYFIQPTVFSNVKDDMLIAQDEIFGPVQSILKFSDVDEVIKRANETKYGLAAGVFTKNLD
TANRVSRALKAGTVWVNCFDVFDAAIPFGGYKMSGNGREKGIYSLNNYLQIKAVVTALNKPAWI

Fig. 5, continued

Rice REF1 Homolog

Skibbe et al., OsALDH1a
Vasilou classification # ALDH2C1

(Rice Accession # AB037421) 1751 bp

aacttccaat ttctctctcc acatctctct gtgtttcttt tatttctcct ctgctcgcgg
61 cgatggcggc ggcgaacggc ggcgacagca aggggttcga ggtgccgaag ctggagatca
121 agttcaccaa gctcttcatc aatggccgct tcgtcgacgc cgtctccggc aagacattcg
181 aaacccgtga cccgcgcacc ggcgaggtca tcgccaagat cgccgaagga gacaaggccg
241 acatcgacct cgccgtgaag gccgccaggg aggccttcga ccatggcccc tggccaagaa
301 tgtccggctt tgcgagggga aggatcctgc acaagttcgc ggacctggtg gagcagcacg
361 tggaggagct ggcggcgctg gacacggtgg acgccggcaa gctgttcgcg atggggaagc
421 tcgtcgacat cccggcggcc gcgaacctgc tccggtacta cgccggcgcg gcggacaagg
481 tgcacggcga gacgctcaag atggcgcggc catgccacgg gtacacgctc aaggagcccg
541 tcggcgtcgt cggccacatc gtgccgtgga actaccccac caccatgttc ttcttcaagg
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721 acgtcgtccc cggcttcggc cccaccgccg gcgccgctat ctcctcccac atggacattg
781 acaaggtgag cttcaccggc tcgacggagg tcggccggct ggtgatggag gcggcggcga
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1081 ttcatcaagg ccctcagatt gacaaggagc aatacgagaa gatcctcaag tacatcgaca
1141 tcggtaagcg cgaaggcgcg acgttggtca ccggagggaa gccctgcggc gaaaacgggt
1201 actacatcga gcccaccatc ttcacggacg tcaaggaaga aatgtcgatc gcgcaagagg
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1381 cgaacacggt ttcgcggtcg atccgggcag gggcaatctg gatcaattgc tacctcggct
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1501 tggacgccct tgagaagtac ctccacacca aggcggtggt caccctctc tacaacaccc
1561 cttggctatg atctgatgat gaacagcaca gaaagattaa ttacagtgga aaaaaataac
1621 atttctatat atacagctga aaggttgggt tatatttgtg gttagttgat tgcttgtatc
1681 aaatatcaat ttgtcggaat aaagacagta tatttcagtt aaaaaaaaaa aaaaaaaaaa
1741 aaaaaaaaaa a

Skibbe et al., OsALDH1a
Vasilou classification # ALDH2C1

(Rice Gene Bank protein ID BAA96794) (cytosolic) (67% identity)

maaanggdsk gfevpkleik ftklfingrf vdavsgktfe trdprtgevi aklaegdkad
61 idlavkaare afdhgpwprm sgfargrilh kfadlveqhv eelaaldtvd agklfamgkl
121 vdipgganll ryyagaadkv hgetlkmarp chgytlkepv gvvghlvpwn ypttmfffka
181 spalaagctm vvkpaeqtpl salfyahlak lagvpdgvln vvpgfgptag aaisshmdid
241 kvsftgstev grlvmeaaak snlkpvslel ggkspvivfd dadldtavnl vhmasytnkg
301 eicvagsriy vqegiydafv kkatemakks vvgdpfnprv hqgpqidkeq yekilkyidi
361 gkregatlvt ggkpcgengy yieptiftdv keemsiaqee ifgpvmalmk fktveeaiqk

Fig. 5, continued

421 anstryglaa givtknidva ntvsrsirag aiwincylgf dpdvpfggyk msgfgkdmgm
481 dalekylhtk avvtplyntp wl

Fig. 5, continued

Rice Mitochondrial REF1 Homolog

Skibbe et al., OsALDH2a
Vasilou classification # ALDH2B5

(GB # AB030939) 1855 bp

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121 ggggcttctt gcctggatca cttcacagat tcagcgctgc accggccgcc gctgccaccg
181 ccgcagccac tgaggagccg atccagccgc cggtggacgt gaagtacacc aagctcctca
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1261 ccacactcgt ggccggcggc gacagggcgg gcagcagggg gttctacatc cagccaaccg
1321 tctttgcaga cgtcgaggac gaaatgaaga tcgcgcagga ggagatattc gggccggtgc
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1501 cattgagggt cgggacggtg tgggtgaaca cctacgacgt gttcgacgcg gccgtcccgt
1561 tcggcggcta caagatgagc ggcgttggca gggagaaggg cgtctacagc ctccgcaact
1621 acctccagac caaggccgtc gtcacgccca tcaaggacgc cgcctggttg tagctgtagt
1681 aatcgatcct ttctctcctc catccccatc gccattgctg cgtgctatga ctgctatccc
1741 gtgctcttcc atatcagttg tcacttgtca gcgtgatgtc tctgaacaac gccagagatt
1801 gcgatgaata atggttaaat cgggcaatct tttgtacaaa aaaaaaaaaa aaaaa

Skibbe et al., OsALDH2a
Vasilou classification # ALDH2B5

(GB # BAA96793) 553 amino acids

maarraassl lsrgliarps aasstgdsal lgagsargfl pgslhrfsaa paaaataaat
61 eepiqppvdv kytkllingn fvdaasgktf atvdprtgdv iarvaegdae dvnravaaar
121 rafdegpwpr mtayercrvl irfadlieqh adelaaletw dggktleqtt gtevpmvary
181 mryyggwadk ihglvvpadg phhvqvlhep igvagqlipw nfpllmfawk vgpalacgna

Fig. 5, continued

241 vvlktaeqtp lsalfvasll heaglpdgvl nvvsgfgpta gaalsshmgv dklaftgstg
301 tgkivlelaa rsnlkpvtle lggkspfivm ddadvdqave lahralffnq gqcccagsrt
361 fvhervydef vekararalq rvvgdpfrtg veqgpqidge qfkkilqyvk sgvdsgatlv
421 aggdragsrg fyiqptvfad vedemkiaqe eifgpvqsil kfstveevvr ranatpygla
481 agvftqrlda antlaralrv gtvwvntydv fdaavpfggy kmsgvgrekg vyslmylqt
541 kavvtpikda awl

Fig. 5, continued

Rice Mitochondrial REF1 Homolog

Skibbe et al., OsALDH2b
Vasilou classification # ALDH2B1

(GB # AB044537) 2115 bp (61% identity to REF1)

CAAAGCAAAGCCGCCATTACTGCTCCTCTTCCATTCCACTGGGGACGTACGAGCTCCGCGCATCC
CTTCCATTCCATTACTGACCTTGGCTGCTGCGGCTGCAGTGCAGAGGGGGTTTGGTGGTGCGGT
TGATTTGAGCAATAAATTCTCTAGGGGGGAGGGAGGTATCGGTCATGGCTGCCGCTGCTGCAAG
GAGGGGCTCATCGCTGCTCTCTCGCTGCCTGCTGTCCAGGCCCGCCGCCGCCGCCTCGCCTGCT
GTCCCCTCTGCGCTCCGCAGGGCAGATGGGACACAAGGATTGTTGCCGGGAATCCTTCAGAGGT
TCAGCACTGCAGCAGTAGCAGAGGAGCCCATATCACCCCCAGTCCAAGTGAACTACACTCAGCTC
CTCATTGATGGAAAATTCGTTGATTCAGCATCTGGCAAAACTTTCCCAACTCTGGACCCTCGTAC
CGGGGAGCTGATTGCCCATGTGGCTGAAGGCGATGCGGAGGATATTAACCGTGCGGTTCATGCG
GCCCGCAAGGCTTTCGATGAAGGGCCATGGCCAAAGATGACTGCCTATGAGAGATCCCGGATTC
TGTTGCGGTTTGCTGACTTGATTGAGAAGCACAACGATGAAATTGCTGCATTGGAGACATGGGA
CAACGGCAAGCCGTATGCGCAAGCTGCCAACATTGAAGTGCCAATGGTGGCACGGCTGATGCGG
TACTATGCTGGTTGGGCTGACAAGATCCATGGGCTTGTCGTGCCGGCTGACGGCCCACACCATG
TACAGGTGCTGCACGAGCCCATTGGTGTCGCAGGTCAGATCATCCCATGGAACTTTCCGCTTCTG
ATGTTTGCGTGGAAAGTTGGCCCTGCTTTGGCTTGTGGAAACACTGTTGTGCTCAAGACGGCTG
AGCAAACTCCTCTGTCTGCTCTATTTGCTTCTAAGCTGTTGCATGAGGCTGGACTCCCAG
ACGGTGTTGTTAACGTGGTATCTGGTTTTGGACCTACTGCTGGTGCTGCTCTTGCTAGTCACATG
GATGTCGATAAGATTGCATTCACTGGATCGACCGATACTGGAAAAGTCGTCCTTGAGTTGGCTGC
AAGGAGCAACCTTAAGTCAGTGACACTGGAGCTAGGAGGCAAGTCTCCTTTCATCATCATGGATG
ATGCTGATGTTGACCATGCTGTTGAGCTTGCGCATTTTGCACTGTTCTTTAACCAGGGACAATGT
TGCTGTGCTGGGTCTCGTACATTTGTGCATGAGCGTATCTATGATGAGTTCGTGGAGAAGGCCA
AGGCTCGTGCTCTCAAGCGTGTGGTTGGTGATCCATTCAAGAATGGTGTTGAACAGGGCCCTCA
GATTGATGACGAGCAATTCAACAAGATCTTGCGCTACATCAAGTATGGTGTTGACAGTGGAGCCA
ACCTTGTGACTGGTGGCGACAGATTAGGTGACAAAGGTTACTACATCCAGCCAACAATTTTCTCG
GATGTACAGGATAACATGAGGATTGCTCAAGAAGAGATATTTGGCCCTGTGCAGTCCATTCTGAA
GTTCAATGATCTGAACGAGGTCATCAAGAGGGCAAATGCAAGCCAGTACGGGCTGGCTGCTGGG
GTCTTCACCAACAACCTGAACACGGCCAACACCCTGACCCGCGCGCTCAGGGTCGGGACCGTGTG
GGTGAACTGCTTCGACGTCTTCGACGCCGCGATCCCGTTCGGCGGATACAAGCAGAGCGGCATC
GGGAGGGAGAAGGGCATCGACAGCCTGAAGAACTACCTGCAGGTCAAGGCCGTCGTCACGCCGA
TCAAGAACGCCGCGTGGTTGTAAACACATAGATGTTTGGACATTTCAGAACTGGGGAAGAAATAG
GTATAATCTTATGGACGGATGCGAAAATGGCGATAAATTATGGCGATAAGATTATGATGATGATG
ATGAAGAAGAAGAAGAGGAGGAGGAAGAACAGCTGAAATAAGCTTGTCCTAGCATGGGGCTGGC
ATTGTCTCTAATAAACCTTGTGGTTGGTGCTCATGTTACTGATGGA
GTATATTGTAGAAGCAGATTTATGTTCATTATGAAATATATATCGCTTGTTTGGGATAAAAAAAAA
AAAAAAAAA

Skibbe et al., OsALDH2b
Vasilou classification # ALDH2B1

GB # BAB19052 (65% identity)

maaaaarrgs sllsrcllsr paaaaspavp salrradgtq gllpgllqrf staavaeepi
61 sppvqvnytq llidgkfvds asgktfptld prtgeliahv aegdaedinr avhaarkafd
121 egpwpkmtay ersrlllrfa dliekhndel aaletwdngk pyaqaaniev pmvarlmryy

Fig. 5, continued

181 agwadkihgl vvpadgphhv qvihepigva gqiipwnfpl lmfawkvgpa lacgntvvlk
241 taeqtplsal faskllheag lpdgvvnvvs gfgptagaal ashmdvdkia ftgstdtgkv
301 vlelaarsnl ksvtlelggk spfiimddad vdhavelahf alffnqgqcc cagsrtfvhe
361 riydefveka karalkrvvg dpfkngveqg pqiddeqfnk ilryikygvd sganlvtggd
421 rlgdkgyyiq ptifsdvqdn mriaqeeifg pvqsilkfnd lnevikrana sqyglaagvf
481 tnnlntantl tralrvgtvw vncfdvfdaa ipfggykqsg igrekgidsl knylqvkavv
541 tpiknaawl

Fig. 5, continued

Maize Cytosolic REF1 Homolog

Skibbe et al., RF2C
Vasilou classification # ALDH2C2

(GB# AF348413) (65% identity)

GCGGCCGCTGCACCTCCTTTCCCACGACTCCCGAGCGCTCTGCGTGTGGCGCGCGGCAGCATGG
CGACTGCGAACGGGAGCAGCAAGGGGTCGTTCGAGGTGCCCAAGGTGGAGGTCAGGTTCACCAA
GCTCTTCATCGACGGCAAGTTCGTCGACGCCGTCTCCGGCAAGACGTTCGAGACCCGGGACCCT
CGCACCGGCGAGGTGATCGCCAGCATCGCGGAGGGAGGCAAGGCCGACGTCGACCTCGCCGTCA
AGGCCGCCCGGGAGGCCTTCGACAACGGGCCCTGGCCCAGGATGACGGGATACGAGCGTGGTC
GGATCCTCCACAGGTTCGCGGACCTGATCGACGAGCACGTGGAGGAGCTGGCGGCGCTGGACAC
GGTGGACGCCGGCAAGCTGTTCGCCGTGGGCAAGGCGCGGGACATCCCGGGCGCCGCGCACCT
GCTGCGCTACTACGCCGGCGCCGCCGACAAGGTGCACGGCGCGACGCTCAAGATGGCGCAGCGG
ATGCACGGGTACACGCTCAAGGAGCCCGTGGGCGTGGTGGGCCACATCGTGCCCTGGAACTACC
CCACCACCATGTTCTTCTTCAAGGTAGGGCCCGCGCTCGCCGCCGGCTGCGCCGTCGTCGTCAAG
CCCGCCGAGCAGACGCCGCTGTCCGCGCTCTTCTACGCGCACCTCGCCAGGGAGGCCGGCGTCC
CAGCCGGCGTGCTCAACGTCGTGCCGGGATTCGGGCCCACGGCCGGGGCCGCCGTCGCCGCCCA
CATGGACGTCGACAAGGTCAGCTTCACCGGGTCCACGGAGGTCGGCCGCCTCGTCATGAGGGCC
GCGGCCGAGAGCAACCTCAAGCCCGTGTCGCTCGAGCTGGGCGGCAAGTCTCCCGTCATCGTCT
TCGACGACGCCGACCTCGACATGGCCGTTAACCTCGTCAACTTCGCCACCTACACCAACAAGGGC
GAGATCTGTGTGGCCGGCACACGCATCTACGTGCAGGAAGGGATCTACGACGAGTTCGTGAAGA
AGGCCGCCGAGCTCGCCAGCAAGTCCGTGGTCGGAGACCCGTTCAACCCGAGTGTCAGCCAGGG
CCCCCAGGTTGACAAGGACCAGTACGAGAAGGTCCTCAGGTACATTGACATCGGAAAGCGCGAA
GGCGCCACGCTGGTCACCGGAGGGAAGCCCTGCGGCGACAATAAGGGCTACTACATCGAGCCCA
CCATCTTCACGGACGTCAAGGACGACATGACGATCGCACAGGATGAAATCTTTGGGCCGGTGAT
GGCTCTCATGAAATTCAAGACCGTGGAGGAGGTGATCCAGAAAGCGAACAACACCCGGTACGGC
CTGGCCGCCGGCATCGTGACCAAGAACATCGACGTCGCCAACACCGTGTCGCGGTCCATCCGCG
CCGGCGCCATCTGGATCAACTGCTACTTCGCGTTCGACCCGGACGCGCCGTTCGGCGGGTACAA
GATGAGCGGGTTCGGCAAGGACATGGGCATGGACGCGCTCGACAAGTACCTGCAGACCAAGACC
GTCGTCACTCCGCTGTACAACACTCCATGGCTCTGACCGACCGACCTCTCATCCTGTCCGATGAA
CAGTTCAACATCACAAACAAGAAGAAACATGTCTTGTAAGATACTCCTCCAAAGGATCGGGTGCC
TGTAGCTGTACTCTTACACCTGCATGGATTGATGTCTTGATGATGTAGTGCAATGTAGCATTCAG
AACAATAAAGACATGTTTCGGACTGC

Skibbe et al., RF2C
Vasilou classification # ALDH2C2

GB # AAL99609

MATANGSSKGSFEVPKVEVRFTKLFIDGKFVDAVSGKTFETRDPRTGEVIASIAEGGKAD
VDLAVKAAREAFDNGPWPRMTGYERGRILHRFADLIDEHVEELAALDTVDAGKLFAVGKARDIPGAA
HLLRYYAGAADKVHGATLKMAQRMHGYTLKEPVGVVGHIVPWNYPTTMFFFKVGPALAAGCAVVVK
PAEQTPLSALFYAHLAREAGVPAGVLNVVPGFGPTAGAAVAAHMDVDKVSFTGSTEVGRLVMRAAA
ESNLKPVSLELGGKSPVIVFDDADLDMAVNLVNFATYTNKGEICVAGTRIYVQEGIYDEFVKKAAELA
SKSVVGDPFNPSVSQGPQVDKDQYEKVLRYIDIGKREGATLVTGGKPCGDNKGYYIEPTIFTDVKDD
MTIAQDEIFGPVMALMKFKTVEEVIQKANNTRYGLAAGIVTKNIDVANTVSRSIRAGAIWINCYFAFD
PDAPFGGYKMSGFGKDMGMDALDKYLQTKTVVTPLYNTPWL

Fig. 5, continued

Maize REF1 Homolog: cytosolic FR2D

Skibbe et al., RF2D
Vasilou classification # ALDH2C3

(GB # AF348415) (61% identity)

gcccttcgac tggagcacga ggacactgac atggactgaa ggagtagaaa agagacgagt
61 cgagtgaggg ggcagaggcc acaaaacaga gagtacccaa acgatcgatc tgtgcatctc
121 cccgtccgtc ccgcaaccat ctaattcaga agcagacatc aatggcgagc aacggctgca
181 acggcaacgg caacggcaac ggcaacggca aggcggctcc ggcgggtgtg gtggtaccgg
241 agatcaagtt caccaagctc ttcatcaacg gcgagttcgt cgacgccgcc tccggcaaga
301 cattcgatac cagggaccca cggaccggcg acgtgctggc ccacgtagca gaggcagaca
361 aagctgatgt ggacctggcg gtgaagtccg cccgggacgc cttcgagcac ggcaagtggc
421 cccgcatgtc aggctacgag cgcgggcgga tcatgagcaa gctggcggac ctggtggagc
481 agcacacgga ggagctggcg gcgctggacg gtgccgacgc cgggaagctg ctgctgctgg
541 gcaagatcat cgacatcccc gcggccacgc agatgctgcg ctactacgcc ggcgccgccg
601 acaagatcca cggcgacgtc ctgcgcgtct ccggcaggta ccagggctac acgctcaagg
661 agcctatcgg cgtcgtgggc gtcatcatcc cctggaactt ccccaccatg atgttcttcc
721 tcaaggtcag cccggcgctc gccgcgggct gcaccgtcgt cgtcaagccc gccgagcaga
781 cgccgctttc cgcgctctac tacgcgcacc tcgcaaagat ggccggcgtc cccgacggag
841 tgatcaacgt cgtccccggg ttcggccccа ccgccggcgc cgcgctcgcc tcccacatgg
901 acgtcgacag cgtggccttc accggctcca cagaggtggg tcgcctcatc atggagtcgg
961 ccgcgcggag caacctcaag acggtctcgc tggagctcgg cggcaagtcg ccgctcatca
1021 tcttcgacga cgccgacgtc gacatggccg ttaacctgtc gaggcttgcc gtcttcttca
1081 acaagggaga ggtttgcgtg gcgggatcgc gcgtgtacgt gcaggaaggg atctatgacg
1141 agttcgtcaa gaaggccgtg gaggccgcgc ggagctggaa ggttggagac ccgttcgatg
1201 tcaccagcaa catgggccct caggttgaca aggaccagtt tgagagggtc ctaaagtaca
1261 ttgagcatgg caagagcgag ggagcgactc tgctcaccgg cggcaagcct gccgccgaca
1321 aagggtacta cattgagccc accatctttg tcgatgtcac tgaggacatg aagatcgcgc
1381 aggaagagat cttcggcccc gtcatgtccc tcatgaagtt caagacggtt gatgaggtga
1441 tcgagaaggc caactgcacc aggtacgggc tcgccgccgg gatcgtgacc aagagcctgg
1501 acgtcgccaa ccgggtgtcc cggtcggtgc gcgccggcac cgtgtgggtg aactgctact
1561 tcgccttcga cccggacgcg cccttcggcg ggtacaagat gagcggcttc ggcgcgggacc
1621 aggggctggc agccatggac aagtacctgc aggtcaagag cgtcatcacc gcgctcccgg
1681 actcgccatg gtactgagtt gagccaggga ccgatggaac cccatcgatc tcttcttgtg
1741 cagtgtacat gcgtcatgcg tgcgtgctca cacagctggg ttgctgcttt gtgcttgtgt
1801 tcgtctctgg tttgtggctc atgtgtgtta gtctgcaccc tatccttctg tacgtagctg
1861 ccggacatgc aaatagtatg ttaagtacac catataaact cttgttttat aaattcaagt
1921 ttagcttgga gccttcactc ccttcagcct tg

Skibbe et al., RF2D
Vasilou classification # ALDH2C3

(AAL99611)

MASNGCNGNGNGNGNGKAAPAGVVVPEIKFTKLFINGEFVDAASGKTFDTRDPRTGDVLAHVAEAD
KADVDLAVKSARDAFEHGKWPRMSGYERGRIMSKLADLVEQHTEELAALDGADAGKLLLLGKIIDIP
AATQMLRYYAGAADKIHGDVLRVSGRYQGYTLKEPIGVVGVIIPWNFPTMMFFLKVSPALAAGCTVV
VKPAEQTPLSALYYAHLAKMAGVPDGVINVVPGFGPTAGAALASHMDVDSVAFTGSTEVGRLIMESA

Fig. 5, continued

ARSNLKTVSLELGGKSPLIIFDDADVDMAVNLSRLAVFFNKGEVCVAGSRVYVQEGIYDEFVKKAVEA
ARSWKVGDPFDVTSNMGPQVDKDQFERVLKYIEHGKSEGATLLTGGKPAADKGYYIEPTIFVDVTE
DMKIAQEEIFGPVMSLMKFKTVDEVIEKANCTRYGLAAGIVTKSLDVANRVSRSVRAGTVWVNCYFA
FDPDAPFGGYKMSGFGRDQGLAAMDKYLQVKSVITALPDSPWY

Fig. 5, continued

Maize REF1 Homolog: mitochondrial RF2A

Maize mitochondrial RF2A
Skibbe et al., RF2A
Vasilou classification # ALDH2B1

nucleotide (GB# U43082) (61% identity)

CCCAAACCAAATCCAAGCGCAAGAGGGGGCAAAGCCGCAAAGGGGGAGGCACCAGGCACCGGCA
GCCATTACTTACTGGTCCTCACTCCCACACCAACCAACCAACCTCCTCTGCCTGCCGCTTCTCCTG
CTGCGGGCGGGCACTGCTGCAAGTACTAGAGGAGGACATCCGCTTCCATTACTGCGCCTGCGGA
GGATCGGAGGAACCAGTAGCGGAGGCTTCGATTTTCGGCGGGCGCAATAAATTTCCCGCATGGC
TCGGAGGGCCGCGTCCTCGCTCGTCTCCCGCTGCCTCCTGGCGAGGGCCCCTGCCGGCGCGCCG
CCCGCTGCCCCCTCTGCGCCGCGCAGGACAGTGCCTGCAGATGGGATGCACAGGCTGTTGCCAG
GTGTCCTTCAGAGGTTCAGCACTGCAGCAGCAGTAGAGGAGCCCATCACGCCGTCAGTCCATGT
GAACTACACAAAGCTCCTCATTAATGGGAACTTTGTTGATTCCGCATCCGGCAAGACCTTCCCAA
CTCTGGACCCTCGTACAGGGGAGGTGATTGCTCATGTGGCTGAGGGTGACGCAGAGGACATTAA
CCGTGCAGTAGCTGCGGCTCGCAAGGCTTTTGATGAAGGGCCATGGCCGAAGATGACTGCCTAT
GAGAGGTCCCGTATCCTACTGCGGTTTGCTGATTTGATAGAGAAGCACAATGACGAGCTTGCTGC
TTTGGAGACATGGGACAACGGGAAGCCATATGAGCAAGCAGCCCAGATTGAAGTACCCATGGTG
GCCCGTCTTATGCGTTACTATGCTGGTTGGGCTGATAAGATCCATGGGCTCATTGTGCCGGCTG
ATGGCCCACACCATGTACAGATCTTGCATGAGCCAATTGGTGTTGCAGGTCAGATCATCCCATGG
AACTTTCCTCTTCTGATGTATGCCTGGAAAGTTGGCCCTGCTTTGGCATGTGGAAATACTCTCGT
GCTCAAGACTGCTGAACAAACCCCTCTATCGGCTTTGTATATCTCCAAATTGTTGCATGAGGCTG
GACTACCTGAGGGTGTTGTGAATGTCGTTTCTGGTTTTGGCCCTACTGCTGGTGCTGCTCTTGCT
AGTCACATGGATGTTGATAAGATCGCATTTACTGGATCTACCGATACTGGAAAAATTATTCTCGA
GTTGGCTGCAAAGAGCAACCTTAAGACAGTGACACTGGAGTTAGGAGGCAAGTCCCCTTTCATCA
TAATGGACGATGCTGATGTTGACCATGCTGTTGAGCTTGCGCACTTTGCCCTGTTCTTTAACCAG
GGACAATGCTGCTGCGCTGGATCTCGCACGTTTGTACATGAGCGTGTTTATGATGAGTTTGTGG
AGAAGGCCAAGGCTCGTGCATTGAAGCGCGTCGTTGGTGATCCGTTCAGGAAAGGTGTTGAACA
GGGCCCGCAGATTGACGACGAGCAATTCAACAAGATCTTGCGCTACATTAGGTATGGTGTTGAC
GGTGGAGCTACCCTTGTGACGGGTGGTGATAGGTTGGGTGACAAGGGTTTCTACATCCAGCCAA
CGATTTTCTCAGATGTCCAGGACGGCATGAAGATTGCTCAGGAGGAGATATTTGGGCCTGTGCA
GTCGATCCTCAAGTTCAAAGACCTCAATGAGGTTATCAAGAGGGCAAACGCGAGCCAGTATGGAT
TGGCCGCCGGCGTGTTCACCAACAGCCTGGACACGGCCAACACCCTGACGCGCGCGCTCAGGGC
CGGGACCGTCTGGGTGAACTGCTTCGACGTCTTCGATGCTGCGATTCCGTTTGGTGGGTACAAG
ATGAGCGGCATCGGGAGGGAGAAGGGCGTTGACAGCCTGAAGAACTACCTGCAGGTGAAGGCG
GTCGTCACCCCAATCAAGAACGCCGCGTGGTTGTAGACGCTGCAAGTGTGGCCTTGTGCACGAG
AACCACGTATATTCATTTCCTGGTCACATCCCCGAACAATGTGAAGGCGTTAATCAGATAGATGA
CGATGAAGAAGAACAACTATAATAAGATTTGCCCTAGCCTGGGTTCTCAGTTATCTCTAATAAGT
TTTATGGTTGGTGCCTATATATTGTGCAATTTGGTTGCTCCCTTTTATTTTGTTTCTTTTTGATAA
GACTGTTCTAGCAACGGATATGCAGAGTTCATTATGAAAATGCATTTGTTAGTGTCTTTGATGGT
TAA

Skibbe et al., RF2A
Vasilou classification # ALDH2B1

protein: (GB # AAC49371)

MARRAASSLVSRCLLARAPAGAPPAAPSAPRRTVPADGMHRLLPGVLQRFSTAAAVEEPITPSVHVN
YTKLLINGNFVDSASGKTFPTLDPRTGEVIAHVAEGDAEDINRAVAAARKAFD

Fig. 5, continued

EGPWPKMTAYERSRILLRFADLIEKHNDELAALETWDNGKPYEQAAQIEVPMVARLMRYYAGWADK
IHGLIVPADGPHHVQILHEPIGVAGQIIPWNFPLLMYAWKVGPALACGNTLVLKTAEQTPLSALYISK
LLHEAGLPEGVVNVVSGFGPTAGAALASHMDVDKIAFTGSTDTGKI
ILELAAKSNLKTVTLELGGKSPFIIMDDADVDHAVELAHFALFFNQGQCCCAGSRTFVHE
RVYDEFVEKAKARALKRVVGDPFRKGVEQGPQIDDEQFNKILRYIRYGVDGGATLVTGGDRLGDKG
FYIQPTIFSDVQDGMKIAQEEIFGPVQSILKFKDLNEVIKRANASQYGLAAGVF
TNSLDTANTLTRALRAGTVWVNCFDVFDAAIPFGGYKMSGIGREKGVDSLKNYLQVKAVVTPIKNAA
WL

Fig. 5, continued

Maize REF1 Homolog: mitochondrial RF2B

Skibbe et al., RF2B
Vasilou classification # ALDH2B6

nucleotide (GB# AF348417) (59% identity)

AAGGCCATCGCTCTCCTAGCCTCGGAGACTTGCCTTTGCATACACATCCCCCCGGAGGGCGGTGG
CCGGAGCTGACCCCTGATCGGACGCGCTTAGCGCCTGAGGGCATGGCTGCAACCGTGAGGAGGG
CTGCTTCCTCCGTCCTCTCTCGCTTCCTCCTCACAAAGCCTTCGCCTTCGCCTGCTTCTGCCGCCG
GCAATAATTCCGCTCTCCTCGGATCAGGGGCTGCTGCTCTTCACAGGTTCAGCACCGCACCGGCA
TCCGCGGCCGCGGCCGCAGAGGAGCCGATCCAGCCCGCGGTGGAGGTGAAGCACACCCAGCTCC
TCATCAATGGCAACTTCGTCGACGCTGCTTCTGGGAAGACGTTCCCGACGCTGGACCCGCGCACC
GGCGAGGTCATCGCGCGCGTCGCCGAGGGCGACAGCGAGGACATCGACCGCGCCGTGGCCGCC
GCCCGCAGGGCCTTCGACGAGGGCCCGTGGCCGAGGATGACCGCCTACGATCGGTGCCGCGTGC
TGCTGCGCTTCGCGGACCTGATCGAGCGGCACGCGGAGGAGGTCGCGGCGCTGGAGACGTGGG
ACAACGGCAAGACGCTGGCGCAGGCGGCGGGGGCCGAGGTGCCCATGGTGGCGCGGTGCGTCC
GGTACTACGCCGGCTGGGCGGACAAGATCCACGGCCTGGTGGCGCCGGCCGACGGCGCGCACCA
CGTGCAGGTGCTGCACGAGCCGGTCGGCGTGGCCGGCCAGATCATCCCCTGGAACTTCCCGCTG
CTCATGTTCGCCTGGAAGGTCGGCCCGGCGCTCGCCTGCGGCAACACCGTCGTCCTCAAGACCG
CCGAGCAGACGCCGCTCTCCGCGCTCTACGTGGCCAACCTCCTCCACGAGGCTGGGCTCCCCGA
GGGTGTTCTGAACGTGGTGTCCGGCTTCGGCCCGACGGCCGGCGCAGCGCTCTCCAGCCACATG
GGTGTCGACAAGCTTGCGTTCACGGGATCGACGGGCACGGGGCAGATCGTGCTCGAGCTGGCG
GCGAGGAGCAACCTTAAGCCGGTGACGCTGGAGCTCGGTGGCAAGTCCCCTTTCATCGTCATGG
ACGACGCCGACGTCGACCAGGCCGTCGAGCTCGCGCACCAGGCGGTCTTCTTCAACCAGGGCCA
ATGCTGCTGCGCCGGGTCGCGGACGTTCGTGCACGAGCGCGTGTACGACGAGTTCGTGGAGAAG
TCCAAGGCCCGCGCCCTGAAGCGCGTCGTCGGCGACCCCTTCAGGGACGGGGTCGAACAGGGGC
CTCAGATCGACGGCGAGCAATTCAACAAGATCTTGCGGTACGTCCAGTCCGGCGTCGACAGCGG
TGCCACCCTCGTCGCCGGCGGCGACAGGGTAGGCGACAGGGGCTTCTACATACAGCCGACGGTG
TTTGCCGACGCCAAGGACGAAATGAAGATCGCTCGGGAGGAGATATTCGGGCCGGTGCAAACCA
TTCTCAAGTTCAGCGGCGTGGAGGAGGTGATCCGGCGCGCGAACGCGACGCCCTACGGGCTGGC
GGCGGGGGTGTTCACGCGGAGCCTGGACGCGGCCAACACCCTGTCGCGGGCGCTGCGGGCGGG
CACCGTGTGGGTGAACTGCTACGACGTGTTCGACGCCACCATCCCGTTCGGCGGCTACAAGATG
AGCGGCGTCGGGCGGGAGAAGGGCATCTACGCCCTCCGCAACTACCTCCAGACAAAGGCCGTCG
TCACACCCATCAAGAACCCCGCATGGCTGTAAATCACATCCTCCGTCCTTGCCCGCACGGCGCTG
CGCCGGTTCTCGGAGAACGTGACGAATAAAACAAACGGTTTGGTTAAAAAGACAAGGACGACGG
AAAAAAAAAAAAAAAAAAAAAAAA

Skibbe et al., RF2B
Vasilou classification # ALDH2B6

protein (GB # AAL99613)

MAATVRRAASSVLSRFLLTKPSPSPASAAGNNSALLGSGAAALHRFSTAPASAAAAAEEP
IQPAVEVKHTQLLINGNFVDAASGKTFPTLDPRTGEVIARVAEGDSEDIDRAVAAARRAFDEGPWPR
MTAYDRCRVLLRFADLIERHAEEVAALETWDNGKTLAQAAGAEVPMVARCVRYYAGWADKIHGLVA
PADGAHHVQVLHEPVGVAGQIIPWNFPLLMFAWKVGPALACGNTVVLKTAEQTPLSALYVANLLHE
AGLPEGVLNVVSGFGPTAGAALSSHMGVDKLAFTGSTGTGQIVLELAARSNLKPVTLELGGKSPFIVM

Fig. 5, continued

DDADVDQAVELAHQAVFFNQGQCCCAGSRTFVHERVYDEFVEKSKARALKRVVGDPFRDGVEQGP
QIDGEQFNKILRYVQSGVDSGATLVAGGDRVGDRGFYIQPTVFADAKDEMKIAREEIFGPVQTILKF
SGVEEVIRRANATPYGLAAGVFTRSLDAANTLSRALRAGTVWVNCYDVFDATIPFGGYKMSGVGRE
KGIYALRNYLQTKAVVTPIKNPAWL

Fig. 5, continued

Tobacco REF1 Homolog: mitochondrial ALDH

Skibbe et al., TobAlDH2a
Vasilou classification # ALDH2B2

(GB # Y09876)

```
   1 ggttcttcaa ttcattacag tgagaaactt tcatttgctc tactgttcat attaatggcg
  61 gctcgtgtgt ttacctctcg tctctctcgc tctttgacat cctcttctca tctgctctca
 121 agaggtttga tcattgtgga taagcaaaaa tcccatctgg gcagaatagc tgcttatcaa
 181 tacagcacgg cggctgctat tgaggaaccg atcaaaccag ctgtcaatgt ggaacatact
 241 aaacttttta tcaatggcca atttgttgat gctgcatcag gaaaaacatt cctaccctt
 301 gaccccagga caggggaggt aattgcacat gttgctgaag gtgatgcaga agatattaat
 361 cgggcagtag ctgctgctcg taaggctttt gacgaaggac catggcctaa aatgaatgct
 421 tatgaaaggt caaagatatt cgtacgcctt gctgatctga ttgaaaaaca taacgatcaa
 481 attgcaacgc tcgagacttg ggatactggg aagccgtatg aacaggctgc taagattgaa
 541 gtaccaatgg ttgtacgtct actccgttat tatgctggct gggcagataa aattcatggt
 601 atgactattc ctgcagatgg accatatcat gttcagacat tgcacgaacc aattggggtt
 661 gctggtcaga ttatcccatg gaactttcct cttctcatgt tttcttggaa gattggacct
 721 gctttagctt gtgggaacac tgtcgtgcta aagacagctg agcagacacc attatctgca
 781 ttctacgtag cacatctgtt acaggaggct gggctgcctg aaggtgtttt gaacatcatt
 841 tctggttttg gtccaacagc tggtgctcct ctttgtagtc atatggatgt cgataagctt
 901 gcttttactg gatcgacaga tacaggaaaa gctatacttt cactggctgc taagagcaat
 961 cttaagccgg tgactttgga acttggaggg aaatcccctt ttattgtttg tgaggatgct
1021 gatattgata cggccgttga acaagctcac tttgctctct tctttaatca ggggcaatgt
1081 tgctgtgctg gatctcggac ttttgttcac gagaaagttt atgatgaatt tcttgagaag
1141 gcaaaggcac gtgccttgaa acgaacagtt ggtgatccgt ttaaatcagg cactgagcag
1201 ggtcctcaga ttgattcaaa acagtttgat aagatcatga attacattag atctggtatc
1261 gatagtggag caactcttga aactggaggt gagcgacttg gtgaacgggg atactatatt
1321 aagcccacag ttttctctaa cgttaaggac gatatgctga ttgcacaaga tgaaatattt
1381 ggtccagtgc agtccatctt aaaatttaag gatgttgatg atgtgatacg gagagctaat
1441 aacagtcggt atggtctagc tgctggagta tttacacaga acattgacac tgcaaacaca
1501 ttgacacgag ccttgagagt tggaacggta tgggttaatt gctttgatac cttcgatgct
1561 acaattcctt ttggtgggta taaaatgagt ggacacggaa gagaaaaggg agaatacagt
1621 ctcaagaatt acttgcaagt aaaggcagtt gtgaccccat tgaagaatcc tgcatggtta
1681 taaacatgat cctcctcagc aatttttaca aataaaacta tatcaagttg ctttatttta
1741 tgatgctgat gacgattaag tgttggtttt ctttaaaact tgctactata agcaaactgc
1801 aattaatttt aacaggcagc agggtttatt gaaagctgcc aaattgccaa atttgccatc
1861 ctttccatac ccttttttta agattagtct tcttgttttt tctactcctc tgcaaggagt
1921 tgttctcttt ttaaattttt attgctcaaa atatgctgcc tccgaatagt ttgggagtga
1981 ggcatgattg ttggttgtat tcatttgttt aaaatataaa gactagaaca aaaagaaaca
2041 ctaaggaatt ctatgtttac tattatgttt t
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```
maarvftsrl srsltssshl lsrgliivdk qkshlgriaa yqystaaaie epikpavnve
  61 htklfingqf vdaasgktfp tidprtgevi ahvaegdaed inravaaark afdegpwpkm
 121 nayerskifv rladliekhn dqiatletwd tgkpyeqaak levpmvvrll ryyagwadki
 181 hgmtipadgp yhvqtlhepl gvagqiipwn fpllmfswki gpalacgntv vlktaeqtpl
 241 safyvahllq eaglpegvln llsgfgptag aplcshmdvd klaftgstdt gkailslaak
 301 snlkpvtlel ggkspfivce dadldtaveq ahfalffnqg qcccagsrtf vhekvydefl
 361 ekakaralkr tvgdpfksgt eqgpqidskq fdkimnyirs gidsgatlet ggerlgergy
 421 yikptvfsnv kddmliaqde ifgpvqsilk fkdvddvirr annsryglaa gvftqnldta
```

Fig. 5, continued

481 ntltralrvg tvwvncfdtf datipfggyk msghgrekge yslknylqvk avvtplknpa
541 wl

Fig. 5, continued

Barley FER1 Homolog: cytosolic ALDH2

(tentative consensus sequences from several partial EST sequences - from TIGR)

TTCGGCACGAGGAACACAACCTCCTTCCCCTCTCTCCACGTAGGCCAAGGGACGAAGCGAAGGGA
ACGGGCGACGTCGATGGCGGCAGCGAACGGCGGCCAGGGGTTTGAGGTGCCGGAACTGGACAT
CAAGTTCACCAAGCTCTTCATCAATGGCCAGTTCGTCGACGCAGCTTCAGGCAAGACGTTCGAGA
CCCGGGACCCACGCACCGGCGAGGTGATCGCCAGGATCGCCGAGGGAGACAAGGCCGACATCGA
CCTCGCCGTGAAGGCCGCCCGCGACGCCTTCGACAACGGCCCCTGGCCCAGAATGCCCGGCTGC
GCAAGGGCAAGGATCCTGCACAAGTTCGCCGACCTGGTCGACCAGCACGTGGAGGAGCTGGCGG
CGCTGGACACGGTGGACGCCGGCAAGCTGTTCCAGATGGGCAAGCTGGTGGACATCCCCGGAGG
CGCCAACCTGCTCCGGTACTACGCCGGTGCC
GCCGACAAGATCCACGGCGAGACGCTCAAGATGGCGCGGCCGCTGCAC
GGGTACACGCTCAAGGAGCCCGTCGGCGTCGTGGGCCACATCGTGCCC
TGGAACTACCCCACCACCATGTTCTTCTTCAAGGTCAGCCCCGCGCTCG
CCGCCGGGTGCACCATGGTCGTCAAGCCGGCCGAGCAGACGCCCCTCT
CCGCGCTCTTCTACGCTCACCTCGCCAAGGAGGCCGGGATCCCCGACG
GCGTCCTCAACGTCGTGCCCGGCTTTGGCCCGACGGCCGGTGCGGCCAT
GGCTTCTCACATGGACATCGACAAGATCAGCTTCACGGGATCCACGGA
GGTCGGGCGGCTGGTCATGCAGGCGGCGGCCCTGAGCAACCTCAAGCC
CGTCTCGCTGGAGCTGGGGGGCAAGTCCCCGATCATCGTGTTTGACGA
CGCCGATGTTGACATGGCCGTGAGCCTCGTTAACATGGCCACCTACACC
AACAAGGGCGAGATCTGCGTCGCTGGCACGCGCATATACGTGCAGGAA
GGGATCTACGACGCCTTTGTGAACAAGTCAGTGGAGCTTGCCAAGAAA
TCCGTGGTCGGAGATCCTTTCAACCCGAACGTACATCAAGGTCCTCAGG
TTGACAAGAATCAATACGAGAAGGTCCTCAAGTACATCGACGTCGGTA
AGAGCGAAGGCGCCACCCTACTCACCGGAGGGAAGGCCTGCAGCGAC
AAGGGTTACTACATCGAGCCCGCCATCTTCACCGACGTCAAGGATGAC
ATGTCGATTGCGCAAGAGGAAATCTTCGGGCCGGTGATGGCTCTCATG
AAATTCAAGACAATGGAGGAGGTGATTCAGAAGGCGAACAGCACCCG
CTATGGCCTGGCCGCCGGCGTGGTGACCAAGAACATCGACACCATGAA
CACCGTGTCGCGGTCGGTCAGGTCCGGGGTCGTCTGGGTTAACTGCTAC
TTCGCCTTCGACCCGGACGCCCCGTTCGGCGGCTGCAAGATGAGCGGC
TTCGGCAAGGACATGGGCACGGATGCCCTCGACAAGTACCTGCACACC
AAGACGGTGGTCACTCCACTCTACAACACGCCCTGGTTGTGATCTGGAC
GGACATCCGATCGAAACGCATGGGGAAAGATTTCCTAGTTATATATAA
TATTTATACAGCTGGATGCTTTCAGGTTACTTCTGCAGTTGTACTTATTA
CTTGTGGTCAATCTTTTTCGTGGTATT

Protein (67.5% identical to At REF1)

Maaanggqgfevpeldikftklfingqfvdaasgktfetrdprtgeviariaegd
kadidlavkaardafdngpwprmpgcararilhkfadlvdqhveelaaldtvdag
klfqmgklvdipgganllryyagaadkihgetlkmarplhgytlkepvgvvghiv

Fig. 5, continued

pwnypttmfffkvspalaagctmvvkpaeqtplsalfyahlakeagipdgvlnvv
pgfgptagaamashmdidkisftgstevgrlvmqaaalsnlkpvslelggkspii
vfddadvdmavslvnmatytnkgeicvagtriyvqegiydafvnksvelakksvv
gdpfnpnvhqgpqvdknqyekvlkyidvgksegatlltggkacsdkgyyiepaif
tdvkddmsiaqeeifgpvmalmkfktmeeviqkanstryglaagvvtknidtmnt
vsrsvrsgvvwvncyfafdpdapfggckmsgfgkdmgtdaldkylhtktvvtply
ntpwl

Fig. 5, continued

Barley REF1 Homolog: Mitochondrial ALDH2

(TC 56519)

CGGCACGAGGCACCATCACTGCTCCTCAGCACTCTTTCCCCCTCCGCGCAGCTGGGGACGCCCTA
CCATTTACTACTGAGCCTCTGAACCCGGAGGACGAGAAGAATTGATTGCTGATCCGGCGCAAACC
AACAGATTCTTCCTGCCTCCGCCGAGATCATCATCATGGCTGCTGCCGCCACGAGGAGGGCCGCC
TCCTCGCTCGTCTCCCGCTGCCTGCTCTCCAGGCCCGCAGCTTCCCCCGCCGCTGTCCCCTCTGC
GCTCCGCAGGGCAGATGGGGCACGTGGATTGTTGCCTGGACTCCTTCAGAGGTTCGGCACTGCA
GCAGCAGCAGAGGAACCCATCTCGCCTTCTGTCCAAGTGGGCGAGACACAGCTCCTCATCAACGG
CAAATTCGTTGATGCTGCATCTGGCAAGACTTTCCCGACTCTGGACCCTCGCACCGGGGAGGTGA
TTGCCCGTGTGTCTGAAGGAGATGCCGAAGATGTTGACCGTGCAGTTGTTGCGGCCCGCAAGGC
ATTCGATGAAGGGCCATGGCCAAAGATGACTGCCTATGAGAGGTCCCGGATTCTTTTGCGATTTG
CTGATTTGATAGAGAAACACAATGATGAAATTGCTGCACTGGAGACGTGGGACAACGGGAAGCC
CTATGAGCAAGCTGCCCACATCGAAGTGCCAATGCTTGCTCGGCTTATGCGGTACTATGCAGGCT
GGACTGACAAGATCCATGGCCTCATCGTACCGGCTGATGGCCCGCACCATGTACAGGTGCTGCAT
GAGCCGATTGGTGTCGTGGGTCAGATCATCCCGTGGAACTTCCCACTTTTGATGTATGGCTGGA
AAGTTGGCCCTGCTTTGGCCTGTGGGAACACTATTGTTCTCAAGACCGCTGAACAAACTCCTCTA
TCTGCCCTCTATGTTTCTAAGCTGTTGCATGAGGCTGGACTACCCGAAGGTGTCCTGAACATCAT
ATCTGGTTTTGGTCCTACCGCTGGGGCTGCTCTTGCTGGCCACATGGACGTTGACAAGATTGCAT
TCAC
TGGATCAACCGATACTGGGAAAGTTATTCTTGAGTTATCTGCACGGAGCAATCTTAAGGCAGTGA
CACTGGAGCTAGGAGGCAAGTCTCCTTTTATCGTCATGGATGATGCAGATATTGACCAAGCTGTT
GAGCTTGCGCATTTTGCGCTGTTTTTCAACCAGGGGCAATGCTGCTGCGCTGGGTCTCGCACGT
TCGTACATGAGCGTGTTTATGATGAGTTTGTTGAGAAGTCAAAGGCTCGTGCTTTGAAGCGTGTA
GTTGGTGATCCATTCAGGAAAGGTGTTGAGCAGGGTCCTCAGATTGATGATGAGCAATTCAAGA
AGATCTTGCGCTACATTAAGTCGGGTGTCGACAGTGGAGCCACCCTTGTGACGGGTGGTGACAA
GTTGGGTGACAAAGGTTACTACATCCAGCCAACAATTTTCTCAGATGTGCAGGATGACATGAAGA
TAGCCCAGGAGGAGATATTCGGGCCTGTTCAGTCAATCTTCAAGTTCAATGACCTCAACGAGGTG
ATCAAGAGGGCGAACGCAAGCCAGTACGGATTGGCCGCCGGCGTTTTTACCAACAACCTGGACA
CGGCCAACACCTTGACGCGTGCCCTCAGGGCCGGCACGATCTGGGTGAACTGCTTTGACATCTTC
GATGCCGCGATCCCCTTCGGCGGGTACAAGATGAGCGGCATCGGTAGGGAGAAGGGCATCGACA
GCCTGAAGAACTACCTGCAAGTCAAGGCGGTCGTCACCGCGCTTAAGAACCCTGCGTGGTTGTG
AGCATAGCACACCTATGGTCTTCTGAGTCTGAGATACCGGACAACGTGAAGACGCAGGGACAATT
GGATGAGAAAAAAAGAAGATGATGATGATAACAACGATGAGGATCTCTAATAAGCCATTCCTTCA
TGGGCAGCCAGCCACCGTCTCTAATTAGTATCATATGTGATTTGGTTTCCTTTGTCAACCGCGGC
AAGACATATATGTTGTATGTTGTAGCAACATTATGTTGATTATAGCTTGTTGGAAAAATTCTCTG
GTTGCAGTTAATCAACTTCTTTTGATCAGTTGTTGTTCTGCGACACATATGAAGCTAATGGTGTT
TCCTATCCTAGTTAATCCATGTCCTTGTTGATCATCAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAA

Protein

Maaaatrraassivsrdlsrpaaspaavpsalrradgargllpgllqrfgtaaaaeepispsvqvgetqllingkfvdaasgktfptl
dprtgevlarvsegdaedvdravvaarkafdegpwpkmtayersrllrfadllekhndelaaletwdngkpyeqaahievpm
larlmryyagwtdkihglivpadgphhvqvlhepigvvgqiipwnfpllmygwkvgpalacgntivlktaeqtplsalyvsklihe
aglpegvlnilsgfgptagaalaghmdvdkiaftgstdtgkvilelsarsnlkavtlelggkspfivmddadidqavelahfalffnq
gqcccagsrtfvhervydefvekskaralkrvvgdpfrkgveqgpqiddeqfkkilryiksgvdsgativtggdklgdkgyyiqpt
ifsdvqddmkiaqeeifgpvqsifkfndlnevikranasqyglaagvftnnldtantltralragtiwvncfdifdaalpfggykms
gigrekgidslknylqvkavvtalknpawl

Fig. 5, continued

Medicago trunculata cytosolic ALDH

(tentative consensus sequences from several partial EST sequences - from TIGR)

CCCATTTCTTTGAAATCTACCATTTCTTTCAAGTTGTCTTGTGACTTGACTCTGGTTTCTTTGGGA
AACACACAAAGATG
ACTCTACCTTCTTCCAATGGCAAGACTAATCTCTCTCTAGAGATTCCCACCATCAAGTTCACCAAA
CTCTTCATCAATGG
AGAATTTGTTGATTCCCTTTCAGGAAAAGAGTTTGAGACAATAGATCCAAGAAGTGGAGAGGTGA
TAGCAAAAATTGCAG
AGGGAACGAAAGAAGACATTGATGTTGCTGTAAAAGCGGCACGTGTCGCTTTCGATGATGGTCC
ATGGCCTCGTATGCCC
GGTTTTGTAAGAGCAAAAATAATGCTGAAATGGGCAGACTTAATTGATCAAAACATAGAAGAAAT
AGCAGCATTAGATAC
AATAGATGCTGGAAAACTATACACTTTCTGCAAAGCTGTTGACATTCCTGGAGTAGCAAATATAA
TACGTTACCTATGCC
GGTGCTGCGGATAAAATTCACGGCAAGGTTTTAAAACCTGCTCGGGAGTTGCACGCATATACTTT
GATGGAGCCAATCGG
TGTCGTTGGACACATTATTCCTTGGAATTTTCCTAGTACTATGTTTGCTGCTAAGGTTGCTCCTG
CTTTGGCTGCTGGTT
GTACTATGGTTCTTAAGCCTGCTGAACAAACACCTCTCTCTGCTTTGTTTTATGCTCATCTTGCTA
AGGAGGCTGGAATT
CCAGATGGAGTGCTCAATGTAGTACCTGGATTTGGTGCAACTGCAGGAGCTGCAATAAGCTCACA
CATGGACATTGATAA
GGTTAGTTTTACCGGTTCAACAGAAGTAGGACGCGAAATAATGGTATCTGCAGCTAGAAGTAATT
TGAAACCAGTTTCAC
TTGAATTAGGAGGAAAATCACCCCTCTTAATTTTTGATGATGCTGATGTTAATAAAGCTGCTGAA
CTTGCTCTCCTTGGC
ATTTTATTTAATAAGGGAGAAATTTGTGTTGCGGGTTCTCGTGTGTTTGTTCAAGAAGGAATCTA
TGATGAATTTGAGAA
GAAGTTGGTGGAGAAAGCAAAAGCTTGGGTTGTTGGTGATCCTTTTGATCCTAAAGTTCAACAAG
GGCCTCAGGTTGACA
AGAAGCAATTTGAAAAAATTCTTTCCTACATTGAGCATGGAAAGAATGATGGCGCAACCCTTTTG
ACAGGTGGTAAAAAA
ATTGGAGACAAGGGTTACTACATTGAGCCTACAATTTTCTCAAATGTTAAGGAGGACATGCGTAT
AGCACAAGATGAAAT
ATTTGGCCCTGTCATGGCACTCATGAAGTTCAAGACTATTGAGGAAGCAATCAAAAGTGCAAACA
ATACAAAATATGGCT
TAGCAGCAGGAATTGTGACAAAGAATTTGGATATAGCAAACACTGTGTCAAGGTCCATTAGAGCA
GGAATTATTTGGATT
AATTGCTACTTTGCCTTTGGAAATGATATTCCTTATGGAGGTTACAAGATGAGTGGGTTTGGAAG
AGATTTTGGATTGGA
ATCATTACATAAATATTTGCAAGTTAAATCTGTTGTAACTCCCATTTACAATTCTCCTTGGCTTTG
AATGTTCTTTGTAT
TTGGGTTATGTGTATTTGAGAGTGAACAAATGGACCTTTTCCATGTATAATTCATCATAATAATAA
CATTATAAGATCTT
ATGTTATGTTACATCCAATC

Protein (72 % identical to At REF1)

Fig. 5, continued

MTLPSSNGKTNLSLEIPTIKFTKLFINGEFVDSLSGKEFETIDPRSGEVIAKIAEGTKED
IDVAVKAARVAFDDGPWPRMPGFVRAKIMLKWADLIDQNIEEIAALDTIDAGKLYTFCKA
VDIPGVANIIRYLAGAADKIHGKVLKPARELHAYTLMEPIGVVGHIIPWNFPSTMFAAKV
APALAAGCTMVLKPAEQTPLSALFYAHLAKEAGIPDGVLNVVPGFGATAGAAISSHMDID
KVSFTGSTEVGREIMVSAARSNLKPVSLELGGKSPLLIFDDADVNKAAELALLGILFNKG
EICVAGSRVFVQEGIYDEFEKKLVEKAKAWVVGDPFDPKVQQGPQVDKKQFEKILSYIEH
GKNDGATLLTGGKKIGDKGYYIEPTIFSNVKEDMRIAQDEIFGPVMALMKFKTIEEAIKS
ANNTKYGLAAGIVTKNLDIANTVSRSIRAGIIWINCYFAFGNDIPYGGYKMSGFGRDFGL
ESLHKYLQVKSVVTPIYNSPWL

Fig. 5, continued

Medicago tunculata REF1 Homolog: cytosolic ALDH2

(tentative consensus sequences from several partial EST sequences - from TIGR)

ATGACTGGCCCAGTTAATGGCGAACCCACCATCAAGTTCACCAAGTTATTCATCGATGGA
GATTTTGTGGATTCGGTTACAGGCAAGACATTTGAAACAATAGATCCAAGAACAGGAGAA
GTTATAGCAAGGATCAGCGAAGGAACCAAAGAAGACATTGATGTTGCTGTAAAGGCAGCT
CGTTATGCATTTGACTTTGGTCCTTGGCCCCGCCTGCCTGGTGCTGAAAGAGCAAAACTT
ATGATGAAATTTGCGGACCTAATTGATGAAAACATAGAAGAGCTAGCAGCACTTGATGCC
ATTGATGCAGGAAAGTTGTACCATATGTGTAAGGCTCTTGACATTCCCTCAGCAGCAAAT
ACACTTCGTTACTATGCAGGTGCAGCTGATAAAATTCATGGAGAGGTATTAAAAGTTGCA
AGAGAGTTCCATGCTTATACATTGATGGAACCAATTGGTGTTGATGGACACATTATTCCT
TGGAACTTTCCCACTTCCCTGTTCTTTGTCAAGGGTAGCCCTTGCTTAACTGCTGGGTGC
ACCATGGTCGTCAAACCTGCTGAGCAAACACCTCTATCTGCTTTGTTTTATGCTCATCTA
GCTAAATTGGCTGGAATCCCAGATGGAGTGATCAATGTAGTACCCGGATTTGGAGCTACT
GCTGGTGCTGCAGTGAGCTCACACATGGACATTGATGCGGTTAGCTTTACTGGTTCAACA
CAAACTGGGCGTGAGATAATGCAAGCTGCAGCTAAGAGTAACTTGAAACATGTTTCACTT
GAATTAGGAGGCAAGTCACCCCTCATAATATTTGATGATGCTGATATTGACAAAGCTACT
GAACTTGCTCTATTAGGCATCCTATTTAACAAGGGAGAAGTGTGTGTTGCAAGTTCACGT
GTGTTTGTTCAAGAAGGGATCTATGATGAATTTGAGAAAAAATTGGTAGAAAAGGCTAAA
ACTTGGGTCATTGGAGACCCATTTGATCCTAAAGTTCAGCAAGGACCTCAAGTTGACAAG
AAACAATTTGAAAAAGTTCTTTCATATATAGAGCATGGGAAGAAAGAAGGAGCTACCCTT
TTGACTGGGGGTAAAACAGTGGGAAACAAAGGATACTATATTGAACCAACAATTTTCTCC
AATATAAAGGATGATATGGTTATAGCACAGGATGAAATATTTGGTCCTGTGATGGCACTG
AAGAAGTTTAAGACTATTGAGGAAGCAATTAAGAGTGCTAATAATACAAGATATGGACTA
GCAGCAGGTATTGTGACAAAGAATTTGGATATTGCAAACACAGTGTCAAGATCCATTCGT
GCAGGCACTATTTGGATAAACTGTTATTTTGCTTTTGGAGATGATATTCCTTTTGGAGGA
TATAAAATGAGTGGATTTGGAAGAGATTATGGATTAGAAGCCCTTCACAAGTATCTACAA
GTTAAATCTGTTGTTACTCCCATTTATAATTCTCCCTGGCTCTA

Protein (72 % identical to At REF1)

MTGPVNGEPTIKFTKLFIDGDFVDSVTGKTFETIDPRTGEVIARISEGTKEDIDVAVKAA
RYAFDFGPWPRLPGAERAKLMMKFADLIDENIEELAALDAIDAGKLYHMCKALDIPSAAN
TLRYYAGAADKIHGEVLKVAREFHAYTLMEPIGVDGHIIPWNFPTSLFFVKGSPCLTAGC
TMVVKPAEQTPLSALFYAHLAKLAGIPDGVINVVPGFGATAGAAVSSHMDIDAVSFTGST
QTGREIMQAAAKSNLKHVSLELGGKSPLIIFDDADIDKATELALLGILFNKGEVCVASSR
VFVQEGIYDEFEKKLVEKAKTWVIGDPFDPKVQQGPQVDKKQFEKVLSYIEHGKKEGATL
LTGGKTVGNKGYYIEPTIFSNIKDDMVIAQDEIFGPVMALKKFKTIEEAIKSANNTRYGL
AAGIVTKNLDIANTVSRSIRAGTIWINCYFAFGDDIPFGGYKMSGFGRDYGLEALHKYLQ
VKSVVTPIYNSPWL

Fig. 5, continued

Medicago trunculata cytosolic ALDH2

(tentative consensus sequences from several partial EST sequences - from TIGR)

ATGACTGATCTTAACTCCAGTAATGGGGACAACAGCTCCTTGTTCAAAATGCCGACCATC
AAGTATAACAAGCTCTTCATCAATGGAGATTTTGTCGATTCTGTATCAGGAAGCACATTT
GAAACAATAGACCCAAGAACAGGAGATGTGATTGCAAGAATAAGTGAAGGAGCAAAAGAA
GACATTGAAATTGCAGTTAAAGCAGCACGTGAAGCATTTGATTCAGGTCCATGGCCCCGG
ATGTCTGGTGTTGAACGTGCGAAAATAATGATGAAATTTGCAGAACTAATTGATGAAAAC
ATAGAAGAACTAGCAACATTAGATGCAATTGATGCTGGCAAGGTGTACTTTATCAACAAG
GCTTTTGAAATTCCTTCAGCAGCAAATACACTACGTTACTATGCAGGTGCTGCTGATAAA
ATTCATGGTGAGGTATTAAAATCTTCTGGCCAATTCCATGCATACACACTGATGGAACCA
ATTGGTGTTGTGGGACACATCATTCCATGGAATGCTCCCACTATGGTTTTCTTCACCAAA
GTTAGCCCTTCCTTAGCTGCTGGGTGCACCATGGTTCTCAAACCTGCTGAACAAACACCT
CTTTCTGCTTTGTTTTATGCCCATCTAGCTAAGCTGGCTGGGATCCCAAATGGAGTGCTG
AATGTAGTACCCGGATTTGGTCCAACTGCTGGTGCTGCAATCAGCTCACACATGGACATA
GATGTTGTCAGCTTTACTGGTTCAGTTGAAGTAGGCCGTGAAATAATGCAAGCTGCAGCT
AAGAGTAATTTAAAACATGTTTCACTTGAATTAGGAGGCAAGTCACCTCTCATAATTTTC
GATGATGCAAACATAGACAAAGCTGTTGAGCTAGCTCTTTTGGGTATCCTAGCTAACAAG
GGAGAAATTTGCGTTGCATGTTCCCGTGTGTTTGTTCAGGAAGGGATCTACGATCAAGTA
GAGAAGAAGTTGGTGGAGAAGGCAAAAGCCTGGGTCATTGGAGATCCTTTTGATCCTAAA
ACTCAACAAGGACCTCAGGCTGATAGGAACCAATTCGAAAAAATCATTTCCTATATTGAG
CATGGAAAGAGAGAAGGAGCTACACTCTTGACTGGAGGTAGAAGAGTGGGCAGTCAGGGC
TACTACATTGAACCTACAATTTTCTCCAATGTAAAGGAGGACATGCTTATAGCACAGGAT
GAAATATTTGGCCCTGTGATGGCACTAATGAAGTTCAAGACTATTGAGGAAGCCATTAAG
AGTGCCAACAATACCAGATATGGCCTAGCAGCAGGCATTGTGACCAAGAACTTGGATATT
GCAAACACTGTTTCAAGGTCCATCCGTGCAGGCATTATTTGGATCAACTCTTATCTTGCC
GTGGGAAGTGACATTCCTTTTGGAGGATATAAAATGAGTGGATTTGGAAGAGATCAGGGA
TTAGAAGCTCTTCACAAGTACTTACAAGTTAAATCCATTGTAACACCTATTTACAATTCT
CCCTGGCTTTG

Protein (69 % identical to At REF1)

MTDLNSSNGDNSSLFKMPTIKYNKLFINGDFVDSVSGSTFETIDPRTGDVIARISEGAKE
DIEIAVKAAREAFDSGPWPRMSGVERAKIMMKFAELIDENIEELATLDAIDAGKVYFINK
AFEIPSAANTLRYYAGAADKIHGEVLKSSGQFHAYTLMEPIGVVGHIIPWNAPTMVFFTK
VSPSLAAGCTMVLKPAEQTPLSALFYAHLAKLAGIPNGVLNVVPGFGPTAGAAISSHMDI
DVVSFTGSVEVGREIMQAAAKSNLKHVSLELGGKSPLIIFDDANIDKAVELALLGILANK
GEICVACSRVFVQEGIYDQVEKKLVEKAKAWVIGDPFDPKTQQGPQADRNQFEKIISYIE
HGKREGATLLTGGRRVGSQGYYIEPTIFSNVKEDMLIAQDEIFGPVMALMKFKTIEEAIK
SANNTRYGLAAGIVTKNLDIANTVSRSIRAGIIWINSYLAVGSDIPFGGYKMSGFGRDQG
LEALHKYLQVKSIVTPIYNSPWL

Fig. 5, continued

Soybean REF1 Homolog

(Tentative consensus sequence from several EST clones from TIGR **(TC133164)**

GGCACGAGGCGCCAGCGTCTCTACGACAATCTCCTTTCTCTCTAACTCATAACTCAGATGAGTGC
CCTCTCTCTAACTCCAGTAGTAGCCACGGCAATTCCTTCCTCAAGATGCCCCCCATCAAGTTTACC
AAGCTCTTCATCAATGGAGATTTCGTTGATTCCATATCAGGAAGGACATTTGAGACTATAGACCC
CAGAAAAGAAGAGGTAATTGCAAGAGTTAGTGAGGGAGATAAAGAAGACATTGATATTGCTGTT
AAAGCAGCACGTCAGGCATTTGACTCGGGTCCATGGCCTCGCTTGCCAGGCTCTGAAAGGGCAA
AAATTATGATGAAATGGGCAGACCTAGTTGATGAAAATATAGAAGAACTAGCAGCATTAGATACC
ATTGATGCTGGAAAGCTATACTATATTAATAAGGTAGCGGAAATTCCTTCAGCTACAAATGCGTT
ACGGTACTATGCAGGTGCTGCTGATAAAATTCACGGTGACGTATTAAAAATGAACGGGGATTTCC
ATGCATATACACTTTTGGAACCAATTGGTGTTGTGGGACAC
ATAATTCCATGGAATGCCCCCAGCCTCTCATTTTTCATCAAGGTTAGCCCTTCCTTAGCTGCAGGC
TGTACTATGGTCCTCAAACCTGCTGAACAAACACCCCTCTCTGCGTGGTGTTATGCTCATATAACT
AAGGTGGCTGGAATCCCAGATGGTGTGCTTAATATAGTACCTGGATTTGGCCCAACTGCTGGCG
CAGCAATAAGCTCACACATGGACATAGATGCGGTCAGTTTTACTGGTTCAATTGAAGTAGGGCGT
GAAGTGATGCAGGCTGCAGCTAGGAGCAATTTAAAACCAGTTTCACTTGAATTAGGAGGCAAGTC
TCCTCTCATTATTTTCAATGACGCGGATATAGACAAAGCTGCCCAGCTTGCTCTCTTTGGCATCAT
GTCTAACAAGGGAGAAATTTGTGTGGCAAGTTCTCGGGTGTTTGTCCAGGAAGAGATCTATGAT
GAATTTGAGAAGAAGTTGGTGGAGAAGGCAAAATCTTGGGTCGTTGGGGATCCTTTTGATCCCA
AATCCCTGCAAGGGCCTCAGGCTGACAGGAACCAATTGGAGAAAATACTCTCCTATATTGAACAC
GGAAAGAGAGAAGGAGCTACCCTTTTGACCGGAGGTAATACAGTGGGCAACAAAGGTTACTACA
TAGAACCTACAATTTTCTGTAATGTAAAGGAGGACATGCTTATAGCACGAGATGAAATATTTGGC
CCTGTACTAGCGCTGATGAAATTTAAGACCATGGAGGAAGCAATTAAAAGTGCTAACAACACCAA
GTATGGCCTAGCAGCAGGAATTGTGACCAAGAATTTGGATACTGCAAACACTATGTCAAGGTCCA
TTCGTGCAGGCATTGTTTGGATCAACTGCTATTTAACCGTAGGGAGTGACGTTCCTTTTGGAGGG
TATAAGATGAGTGGATTTGGAAGAGATTTGGGATTGCAGGCCCTTCATAAGTACTTACAAGTTAA
ATCTGTTGTAACACCTATTCACAATTCTCCTTGGCTTTGAATAATTGAATGTCTCCTACATGAGCA
CATATGCGTGTCTTCTCTCATTTGAAATAAATTACACTTTATTTCCTTATGATGTATGACTTAAAA
ATACTTAGTCTCTTGTATTATGAGTTCTTTGTTTTATTACAACGTTGTTAACTT

Protein (TC133164) (70% identity with REF1 at amino acid level)

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Fig. 5, continued

Wheat REF1 Homolog: cytoplasmic ALDH2

(TC71803)

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Protein

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tpgl

Fig. 5, continued

Wheat REF1 Homolog: mitochondrial ALDH2

(TC63592)

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Protein

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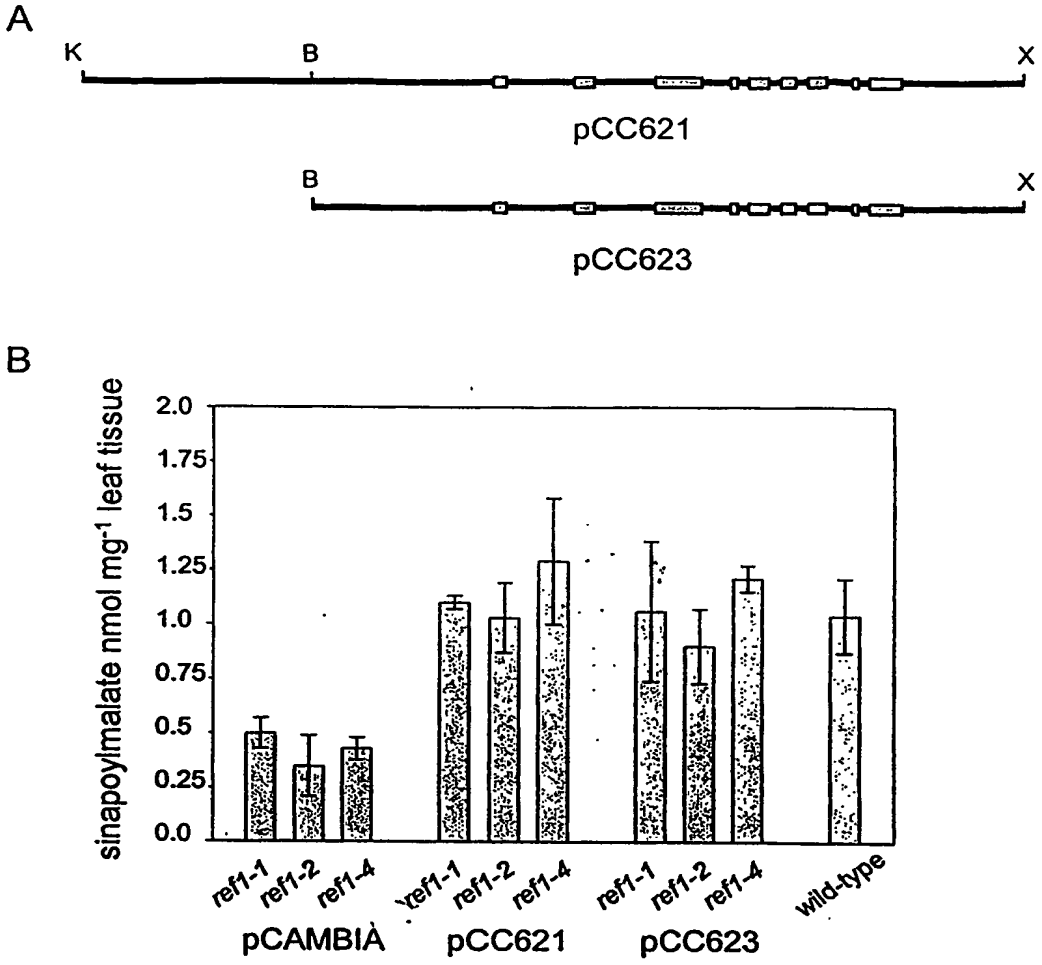
Fig. 6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pCC623
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1.0
0.75
0.5
0.25
0.0
ref1-1
ref1-2
ref1-4
ref1-1
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ref1-4
ref1-1
ref1-2
ref1-4
wild-type
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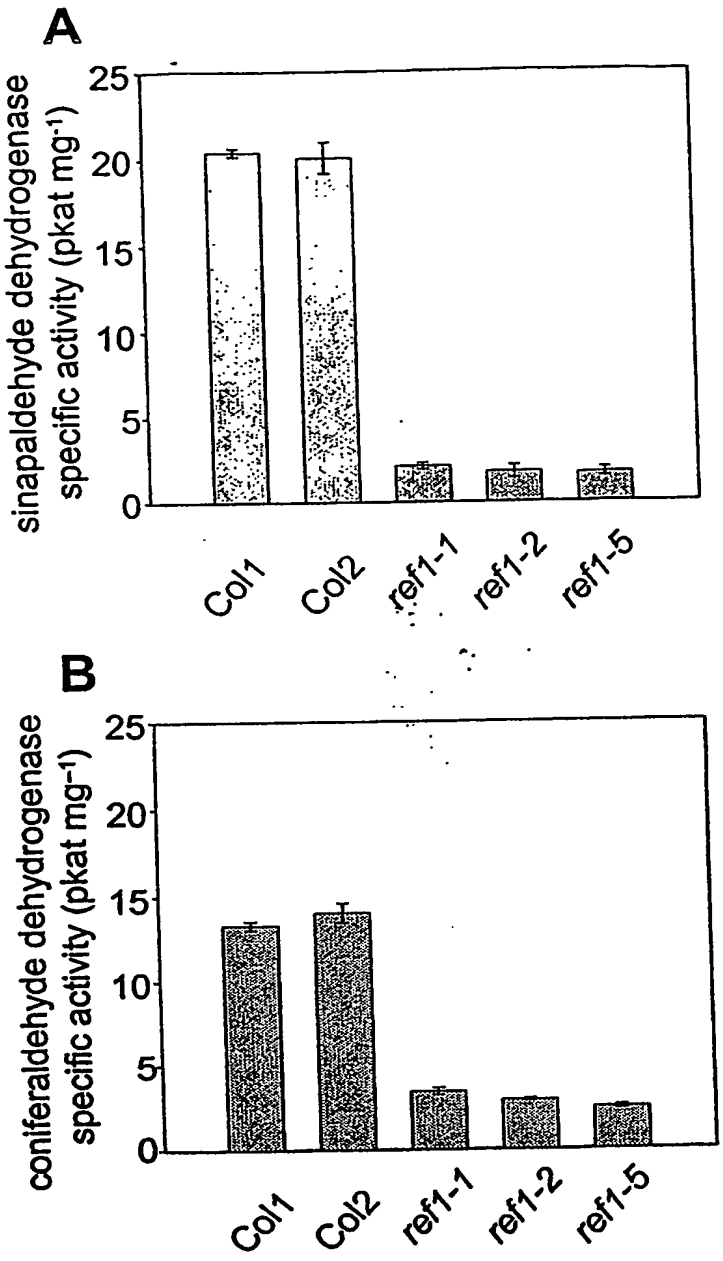
pCC621
pCC623

Fig. 7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15
10
5
0
Col1
Col2
ref1-1
ref1-2
ref1-5
B
coniferaldehyde dehydrogenase specific activity (pkat mg-1)
25
20
15
10
5
0
Col1
Col2
ref1-1
ref1-2
ref1-5